

to continually update smart decision beam selection 620 during the remainder of the call. In addition, in some situations, steps 640 through 646 may be repeated one or more times before using a smart decision beam selection 620. In particular, steps 640 through 646 may be repeated one or more times until smart decision beam selection module 410 has sufficient data to determine an adequate smart decision beam selection 620.

Smart antenna system 14 may provide a number of advantages. For example, in some embodiments, smart antenna apparatus 16 may be coupled to a new or existing base station transceiver as an add-on or applique without having to modify, alter, or reconfigure the base station transceiver or any other component of the base station system, such as base station controllers. Thus, the cost and labor of modifying or altering base station system 12 and/or dealing or negotiating with the manufacturer of the components of base station system 12, such as base station transceiver 24 and base station controller 26, is eliminated in some embodiments. Moreover, smart antenna apparatus 16 may be compatible with base station transceivers produced by a variety of manufacturers. For example, smart antenna apparatus 16 may be compatible with all base station transceivers using standard base station transceiver interfaces. For at least the reasons discussed above, the installation costs of smart antenna apparatus 16 are reduced as compared with traditional smart antenna systems. Moreover, the operating costs of smart antenna apparatus 16 are reduced as compared with traditional smart antenna systems.

In addition, the presence and operation of smart antenna apparatus 16 may be transparent to the base station system, including the base station transceiver. In other words, smart antenna apparatus 16 causes little delay (and in some embodiments, no delay) in the reception and transmission of radio signals to and from the base station transceiver. Thus, smart antenna apparatus 16 may operate without affecting the timing of the cellular network or any mobile stations.

In addition, the beam selection systems and methods provided by smart antenna apparatus 16 as described above with reference to FIGS. 11 through 23 may provide a number of advantages. For example, smart antenna apparatus 16 may reduce the interference, such as multi-path and co-channel interference, associated with uplink signals received by a new or existing base station transceiver. In addition, smart antenna apparatus 16 may reduce the interference associated with downlink signals received by mobile stations. Thus, smart antenna apparatus 16 may increase the effective capacity and improve the overall performance of the base station transceiver without requiring any modifications to the base station transceiver. For example, since using narrow beams generally increases the range (or coverage) of effective reception and transmission as compared with wide beams; smart antenna apparatus 16 may increase the range of the base station transceiver to which it is added. Moreover, smart antenna apparatus 16 may improve the signal-to-noise ratio (SNR) of transmitted and/or received signals, and thus increases the data rate which may be transmitted and/or received by the base station transceiver.

In some embodiments, smart antenna apparatus 16 may reduce the interference associated with received and/or transmitted signals better than traditional smart antenna systems. As a result, smart antenna apparatus 16 may provide increased capacity, coverage, and efficiency as compared with traditional smart antenna systems.

Although embodiments of the invention and their advantages are described in detail, a person of ordinary skill in the art could make various alterations, additions, and omissions without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A method, comprising:

receiving one or more input signals at a smart antenna array;

forming one or more uplink beam signals from the received one or more input signals;

receiving the one or more formed uplink beam signals at one or more receivers;

analyzing at least some of the one or more received uplink beam signals;

selecting at least one uplink beam signal from the one or more analyzed uplink beam signals; and

switching to the at least one selected uplink beam signal.

2. The method of claim 1, further comprising communicating the at least one selected uplink beam signal to a base station transceiver.

3. The method of claim 1, wherein the receivers correspond with at least one of the one or more formed uplink beam signals and wherein at least some of the one or more uplink beam signals comprise signals transmitted by a mobile station.

4. The method of claim 1, wherein switching to the at least one selected uplink beam signal allows reception of a signal communicated in the at least one selected uplink beam signal at a base station transceiver.

5. The method of claim 3, wherein the signals transmitted by the mobile station comprise a burst in a random access channel.

6. The method of claim 3, wherein the signals transmitted by the mobile station comprise a communication initiation request.

7. A method comprising:

receiving one or more input signals at a smart antenna array;

forming one or more uplink beam signals from the received one or more input signals at a beam forming network;

receiving signals via the one or more formed uplink beam signals, wherein the one or more uplink beam signals received include a signal sequence;

correlating the signal sequence received with one or more known training sequences; and

selecting the one or more received beam signals for communication.

8. The method of claim 7, wherein selecting one or more received beam signals for communication further comprises selecting one or more received beam signals for communication to communicate uplink signals.

9. The method of claim 7, wherein selecting one or more received beam signals for communication further comprises selecting one or more received beam signals for communication to communicate downlink signals.

10. A method comprising:

receiving input signals at a smart antenna apparatus via one or more beam signals, wherein the one or more beam signals are formed by a beam forming network and the one or more beam signals include a signal sequence;

correlating the signal sequence received with one or more known training sequences; and

selecting the one or more beam received signals for communication based at least in part on one or more parameters.

11. The method of claim 10, wherein said selecting the one or more received beam signals for communication further comprises selecting the one or more received beam signals for communication to communicate uplink signals.

12. The method of claim 10, wherein said selecting the one or more received beam signals for communication further comprises selecting the one or more received beam signals for communication to communicate downlink signals.